An Aquatic Psychodid.

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While "hunting" Blepharoceridæ last March in the streams of the Sierra Morena Mountains, a few miles west of Stanford University, my attention was attracted to some very small Blepharocerid-like larvæ and pupæ which prove to be immature stages of a new species of *Psychodid*. Baron Osten Sacken in referring to some similar aquatic *Psychodid* larvæ and pupæ discovered by Fritz Muller in Brazil twenty years ago, writes of the "extraordinary interest" which the study of these "very remarkable aquatic larvæ" possess. As these new California larvæ show all of the "remarkable structural" details exhibited by the Brazilian specimens they should possess a similar interest. They are certainly very curious and suggestive immature flies.

The family Psychodidæ, the interesting "moth flies," is unusually well represented on the Pacific Coast, and certain species are very common. Mr. Trevor Kincaid of the University of Washington has determined a dozen or more species on the coast of which 10 have been described from coast specimens. I have found certain species numerous about Stanford and along the seashore twenty miles west of here. I am acquainted with the immature stages of but one species, however, that one being a form recently described from my specimens by Kincaid under the name of *Pericoma californiensis*.*

In the paper of Miall and Walker† on the life history of *Pericoma canescens*, a paper which I have unfortunately not been able to see, there is, as I learn from an abstract of it, a condensed account of our present knowledge of the early stages of the Psychoidæ, and a list of fourteen papers containing this knowledge. The larva of *Pericoma canescens* is semi-aquatic; it breathes air from above the surface, but it can remain immersed "for a long time together." "The larvæ seem most at home in water just deep enough to cover the body." Fritz Muller's aquatic Psychodids which he found in Brazil and gave

* Kincaid, T.

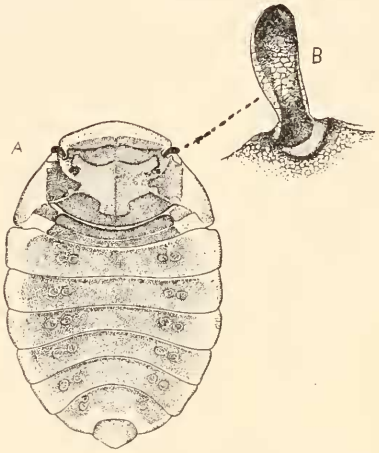
† Miall, L. C., and Walker, Norman, The Life History of *Pericoma canescens*, Trans. Ent. Soc. London, 1895.

accounts of in the Zool. Anzeiger, 1881, p. 499, the Entomologische Nachrichten, 1888, p. 273, and finally, with good figures in the Trans. Ent. Soc. London, 1895, part IV, p. 483, are remarkable in that the larvæ are provided with both spiracles and tracheal gills, for breating air above or beneath the surface of the water, and are provided also with a series of median ventral suckers, reminding one of the condition of all *Blepharocerid* larvæ. The pupæ of these Brazilian Psychodids is remarkable for its great modification, being broad, flattened, provided with prothoracic breathing tubes, and clinging immovably by its ventral aspect to the surface of a rock wall, in all respects a structure, appearance and habit very like those shown by the pupæ of Blepharoceridæ. The pupa of Miall's semi-aquatic *Psychodid* is of the usual Tipulid-like type and the larva has no ventral suckers and has only spiracles, not tracheal gills.

My Californian aquatic *Psychodid* is of the type of Muller's Brazilian forms. The larvæ and especially pupæ are strongly like *Blepharocerid* larvæ and pupæ, in miniature, and have nearly the same habit. The larvæ which I found abundantly on March 1 and later dates in Los Gatos Creek, and other streams in the Sierra Morena Mountains, Santa Clara County, live on the stones of the stream bed not usually submerged but always at the very verge of the water, sometimes submerged, sometimes above the water surface, but always wetted by the current or spray. They are when full grown about 2.5 mm. long and about 1 mm. wide. They are, as Muller says of the Brazilian specimens, oniseiform but are narower and more elongate in shape than *Oniscus*. The shape and general appearance can be clearly understood by referring to Figure 1, in which both dorsal and ventral aspects are shown. They are not flat but rather thick, and the dorsal surface is quite firm. The ventral surface bears eight median segmentally arranged suckers by which the larva holds firmly (but not nearly so strongly as the larva of the Blepharoceridæ) to the surface on which it rests. There are no thoracic breathing tubes and openings, as described for *Pericoma* by Miall, but simply a pair of spiracles at the posterior tip of the abdomen, anal spiracles,

lying just between the strongly haired clavate processes shown in the figures. In the examination of nearly one hundred specimens (killed by various killing reagents and preserved in alcohol) I find no trace of any anal tracheal gills as described by Muller for the Brazilian larvæ. But Muller expressly states that these gills can be retracted (are always retracted in fact when the larva is above the water), it is possible that my larvæ are provided with them. If so they must be very small and delicate, for they have escaped my observation and numerous dissections.*

The pupæ (Fig. 2, A) are found in the same places with the

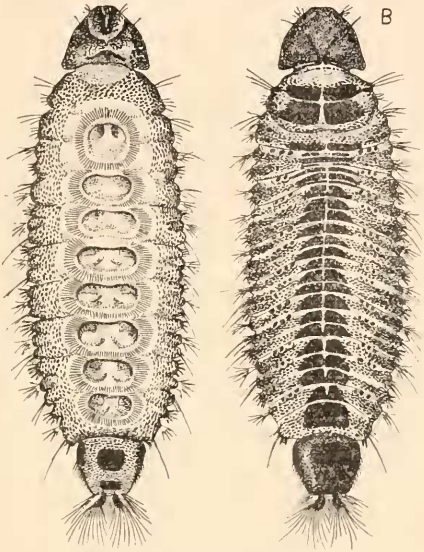


Pupa *Pericoma californica* Kincaid.
A, dorsal aspect; B, prothoracic breathing tube.

larvæ, although usually a little higher on the rocks and are thus less wetted. They are broadly shield-shaped, flat and adherent, quite of the general character of *Blepharocerid* pupæ, but less convex and of course much smaller. They are 2.5 mm. long and 2 mm. wide at the middle. They have a pair of short clavate prothoric breathing tubes. These organs are not composed of several lamellæ, as with the Blephoroceridæ, but are single, sub-cylindrical and have a fine mesh-work covering

* I shall have opportunity to see living larvæ again next March, this point can be settled then.

(Fig. 2, B). The dorsal wall of the pupa is firm, being fairly strongly chitinized. The flat ventral surface adherent to the rock is unchitinized, and the folded wings and legs lie uncovered, although of course perfectly protected by the dorsal wall. There are no sucking discs on the ventral surface of the pupa, but the adherence is, nevertheless, sufficient to prevent the



Pericoma californica Kincaid.
A, ventral aspect; B, dorsal aspect.

pupæ from being carried away by the occasional splashes of water which strike them. The pupæ were more plentiful than larvæ by April 5th, and adults were issuing at this time. Pupæ were found, however, at the same time, March 1st, that the larvæ were first noted.

I may add to this brief account of the immature stages of *Pericoma californica* that I found on July 25th in a small stream in the Rocky mountains of Larimer County, Colorado, two pupæ evidently *Psychodid* but different from the pupæ of the Californian *Pericoma*. The prothoracic breathing tubes of the Colorado form were long and tapering and flexible; the shape and general flat shield-shaped adherent character of the body was the same as in *Pericoma californica*.